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Innovations II: Designing a Cost Effective Vertical-Slot Fishway

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Heath Robinson
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Jacobs

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Designing a cost effective vertical-slot fishway.

Matthew Gordos[1], Martin Mallen-Cooper[2], Heath Robinson[3], Steven Slarke[4] & Craig Copeland[1]

[1]NSW Department of Primary Industries Fisheries

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[3]NSW Public Works

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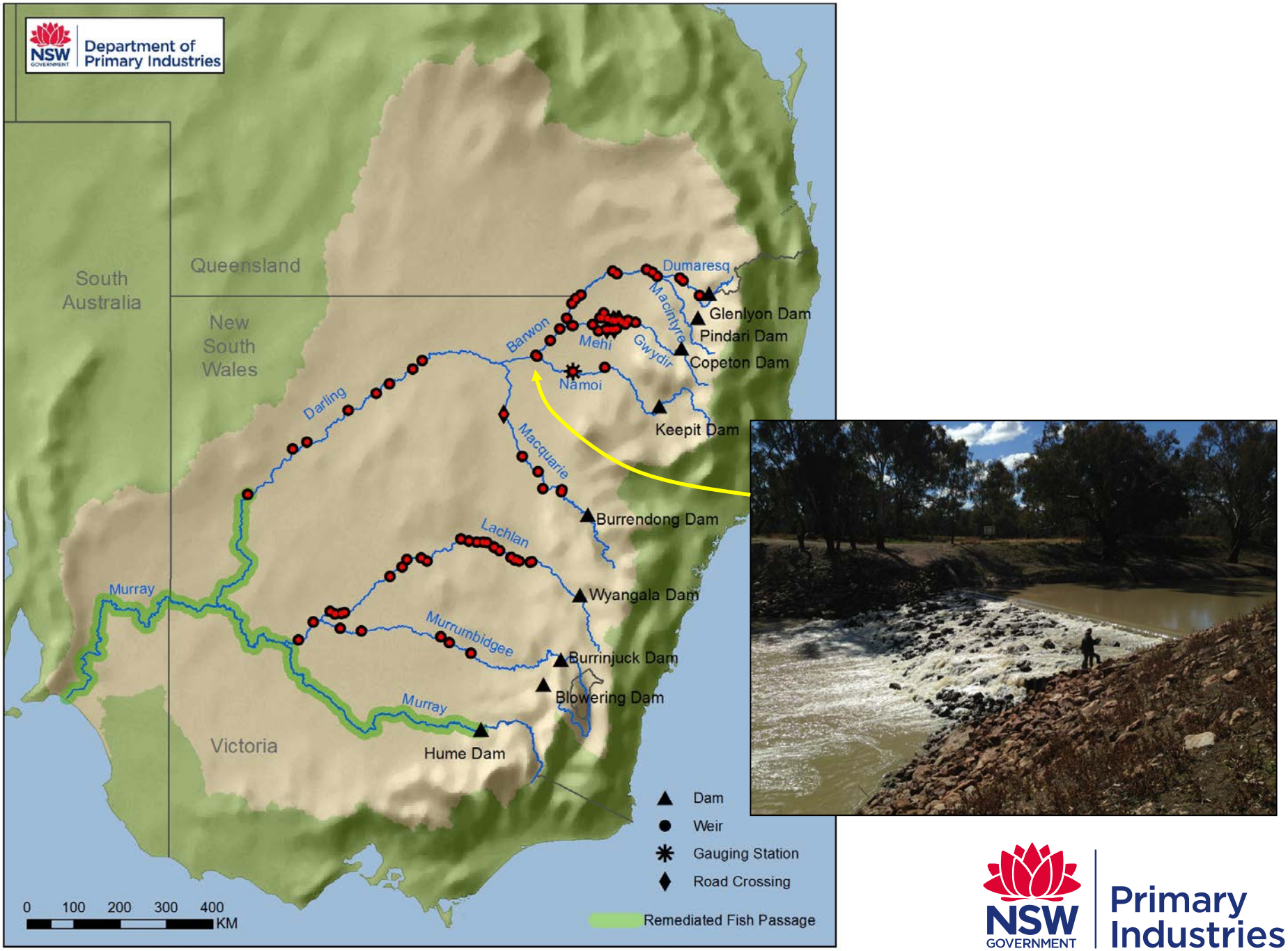

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Walgett Weir

- Weir raising
- Fishway requested
- Estimate - $5.8 M
- Funding - $1.1 M

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Fishway Criteria Re-evaluated

- Ecological
- Hydrological
- Hydrodynamic
- Structural

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Ecological Criteria

NATIVE SPECIES	BODY SIZE	MIGRATION SCALE	ECOHYDRAULIC GUILD	HABITAT GUILD	BASIN POP TREND	ABUNDANCE
Murray Cod	Large	Meso	Meso Lotic	Channels	Decline	Common
Golden Perch	Medium	Macro	Macro Lotic	Channels	Decline	Common
Bony Herring	Medium	Meso	Meso Lotic / Lentic	Generalist	Stable	Abundant
Spangled Perch	Medium	Meso	Meso Lotic / Lentic	Generalist	Stable	Rare
Freshwater Catfish	Medium	Meso	Meso Lotic / Lentic	Generalist	Decline	Absent
Carp Gudgeons	Small	Micro	Micro Lotic / Lentic	Generalist	Stable	Common
Australian Smelt	Small	Micro	Micro Lotic / Lentic	Generalist	Stable	Common
Unspecked Hardyhead	Small	Micro	Micro Lotic / Lentic	Generalist	Stable	Rare
Murray-Darling Rainbowfish	Small	Micro	Micro Lotic / Lentic	Generalist	Stable	Rare

Micro (< 100 m); Meso (100 m – 10s km); Macro (100s km)

Large Body Size (700 - 1500 mm); Medium Body Size (100 - 700 mm); Small Body Size (20 - 100 mm)

Mallen-Cooper & Zampatti 2015

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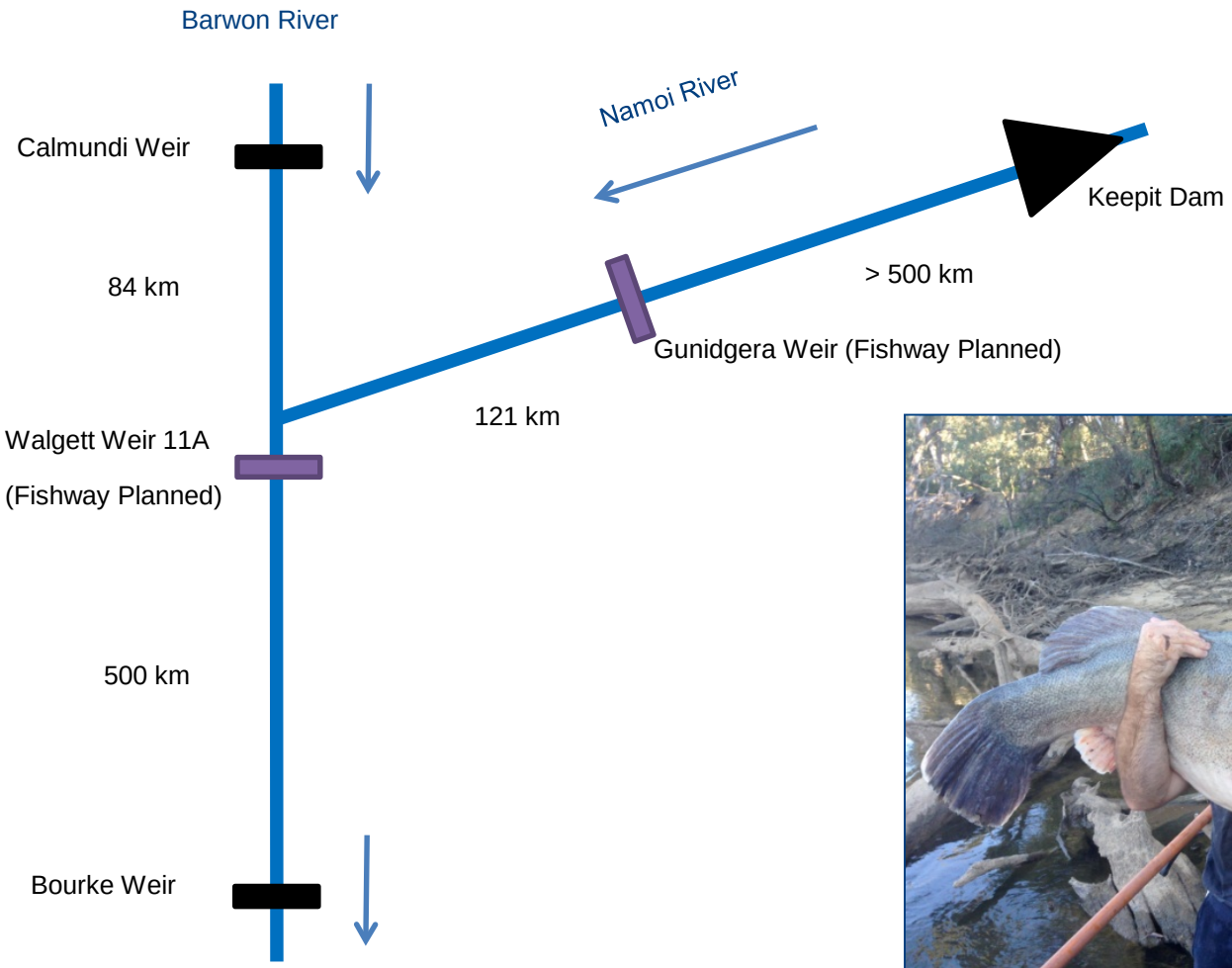

Murray Cod

Photo – Nathan Reynoldson

- **Considerable US & DS habitat**

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Micro (< 100 m); Meso (100 m – 10s km); Macro (100s km)

Large Body Size (700 - 1500 mm); Medium Body Size (100 - 500 mm); Small Body Size (20 - 100 mm)

Mallen-Cooper & Zampatti 2015

- **Reduce cell size from 3.0 x 2.0 m to 2.5 x 1.8 m**

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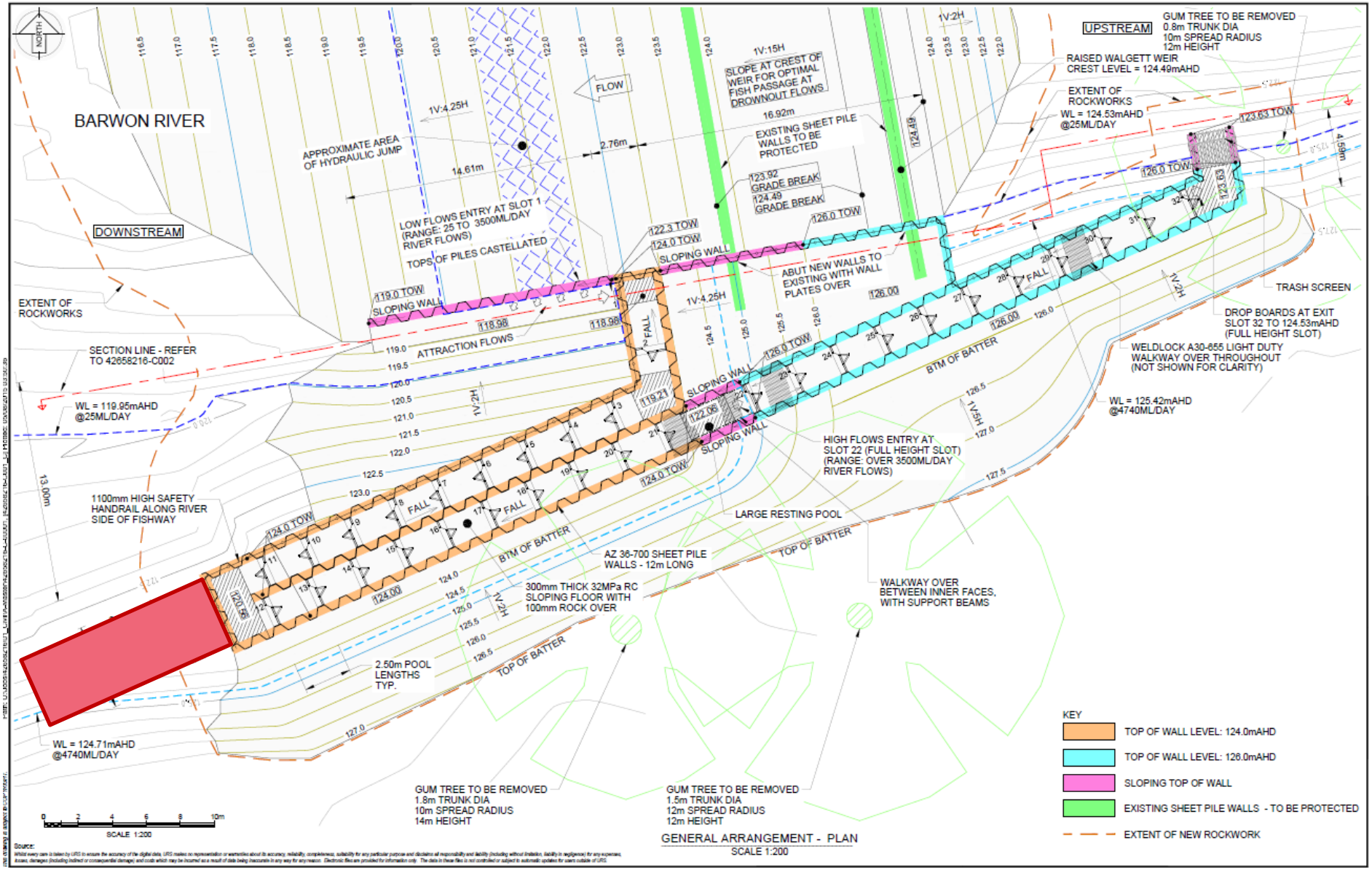

- **Reduced fishway length = 16 m**
- **Cost savings ~ $460,000**

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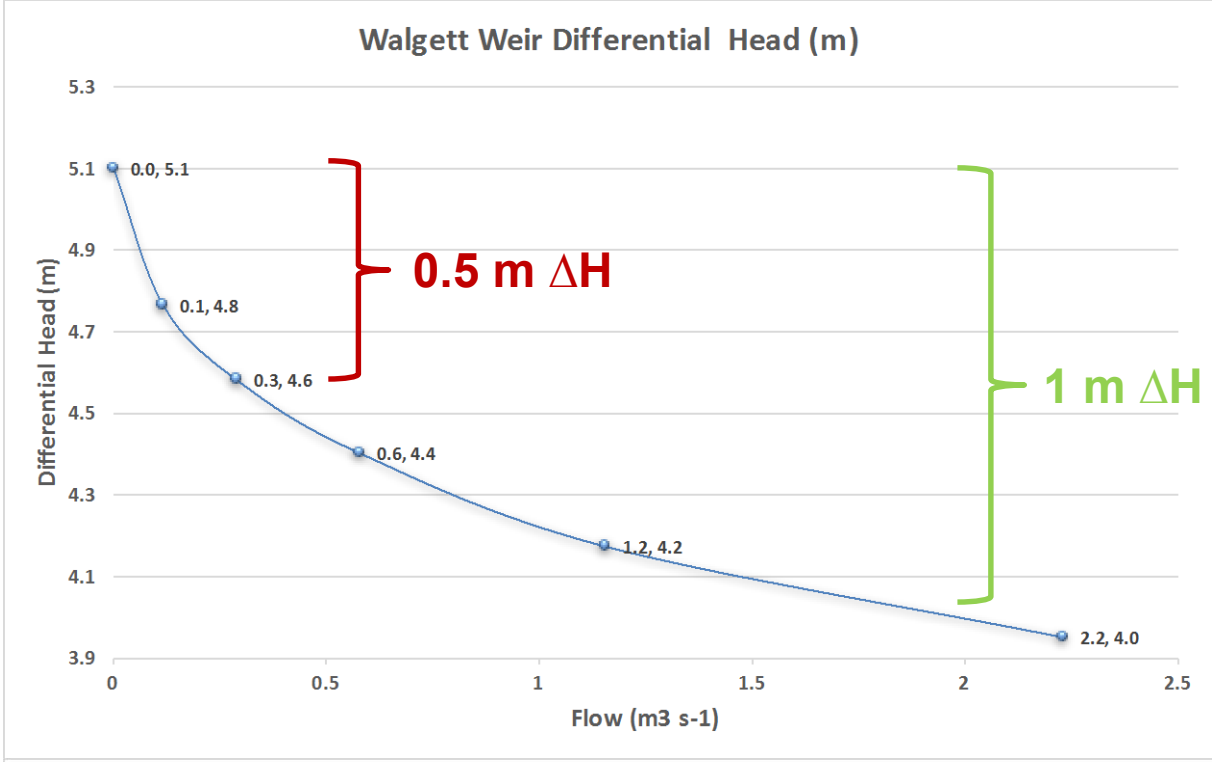
Hydrologic Criteria

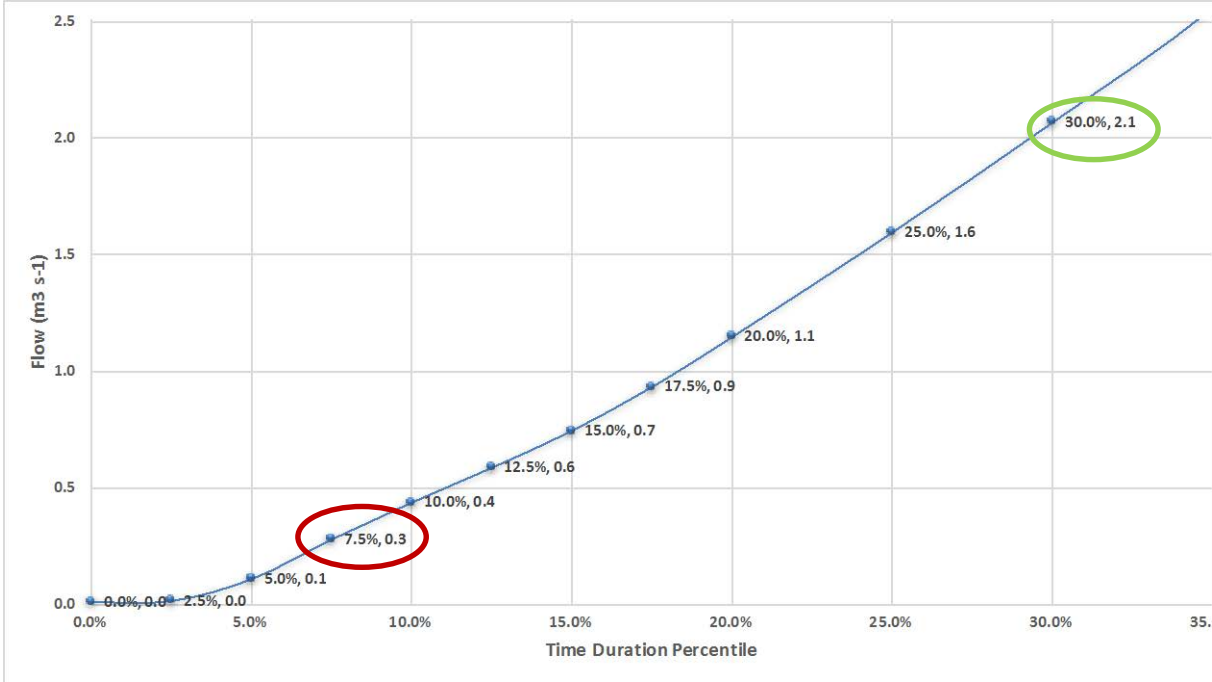
0 m^3/s to 75 m^3/s - ΔH = 5.1m

0.3 m^3/s to 75 m^3/s - ΔH = 4.6 m

Reduced fishway length = 7.5 m

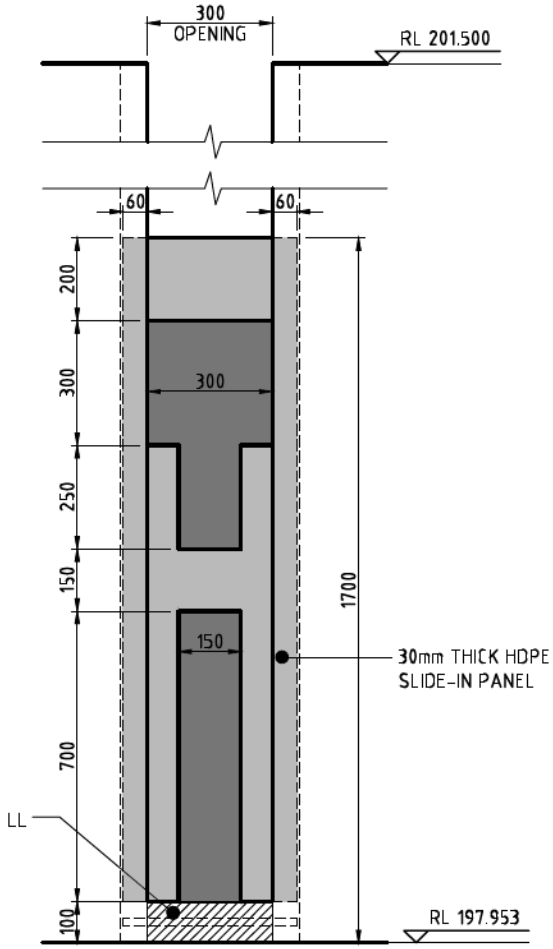
Cost savings ~ $220,000





Hydrodynamic Criteria

- **Turbulence – discharge & volume**
  - **Keyed slots**
  - **Cell Size**
    - **3.0 m x 2.0 m = 50 W/m3**
    - **2.5 m x 1.8 m = 65 W/m3**
    - **2.5 m x 2.5 m = 45 W/m3**



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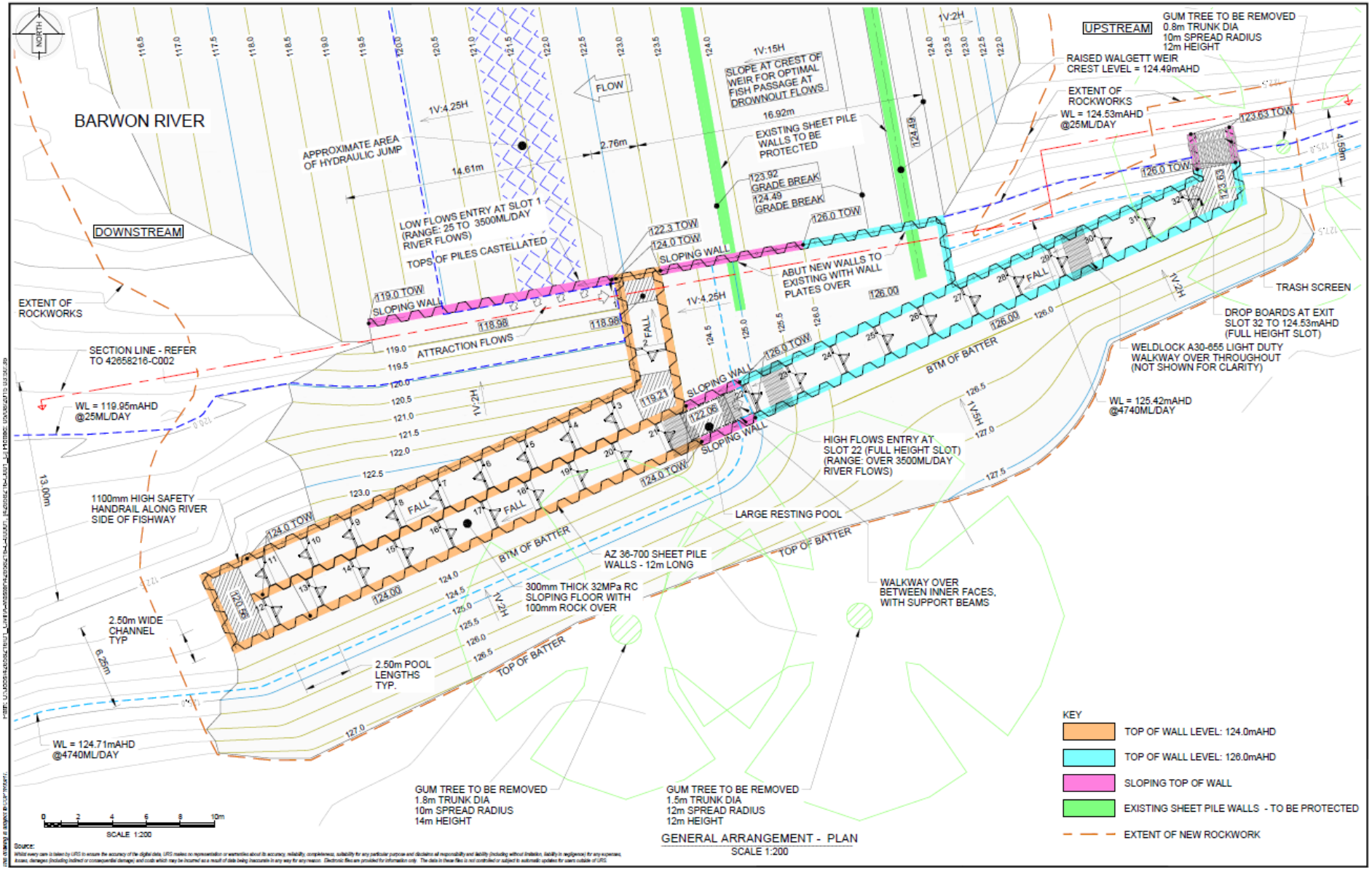

- **Cost implication - negligible**

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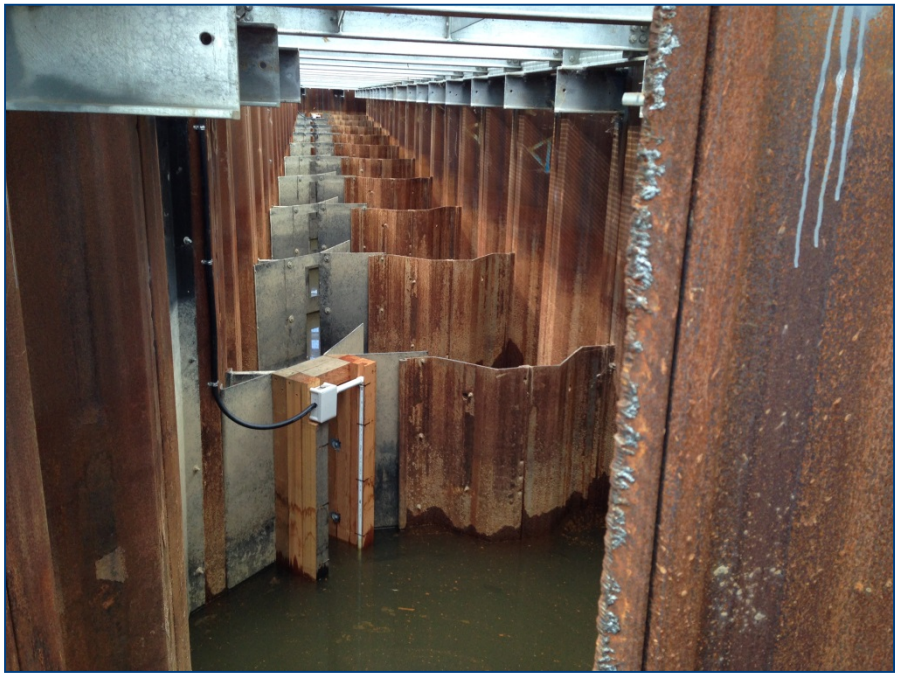
Structure Design

- Design Life
  - Concrete – 100 yrs
  - Sheet Pile – 50 yrs
  - Savings - $1 M



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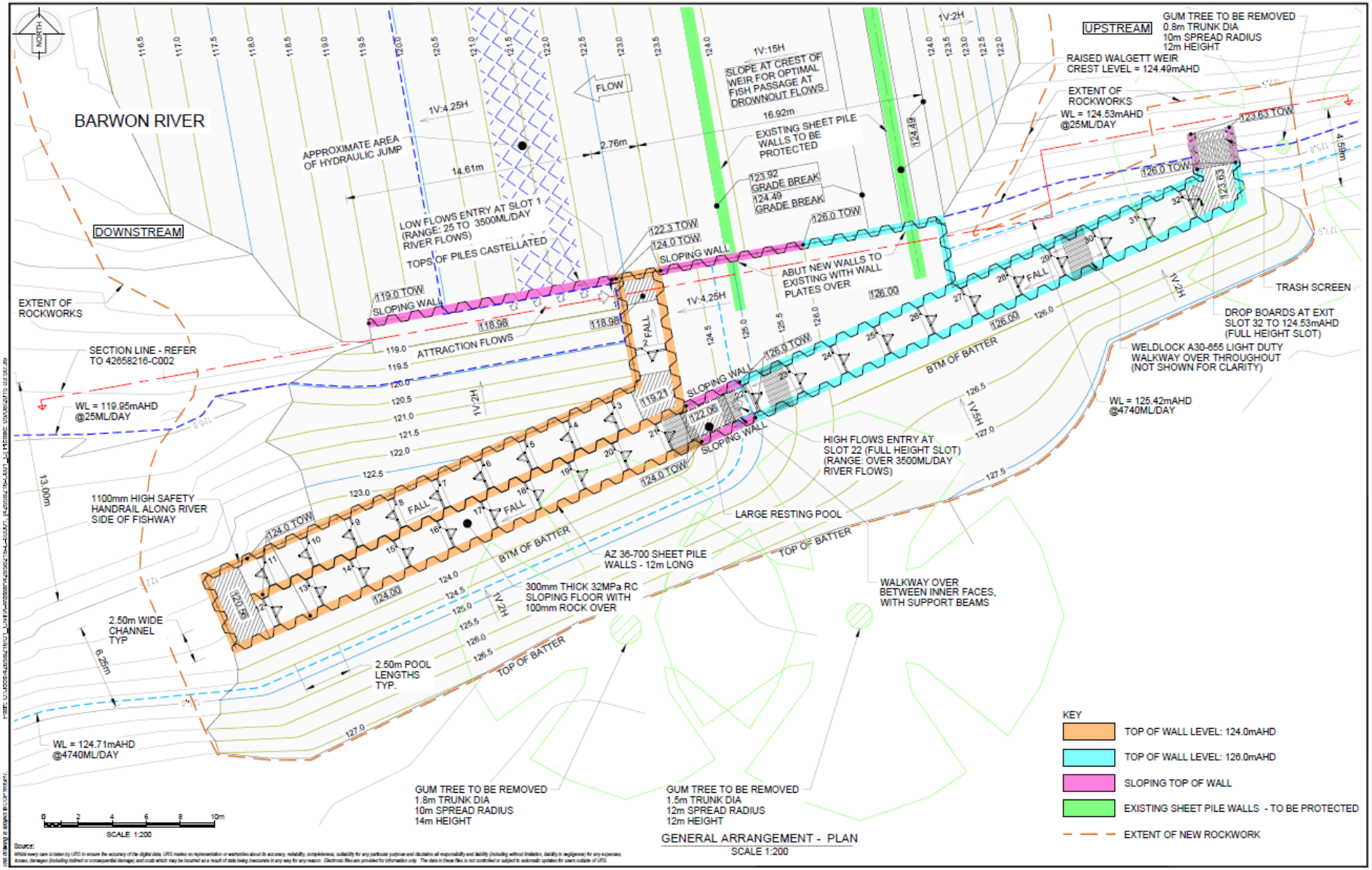

- **Initial estimate = $5.8 M**
- **Revised design = $3.1 M (46.5 % savings)**

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